

Species Diversity, 2000, 5, 177–182

***Mesenchytraeus kuril*, a New Species of Enchytraeidae (Annelida: Oligochaeta) from Kamčatka, Russian Far East**

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(Received 13 May 1998; Accepted 11 July 2000)

Mesenchytraeus kuril sp. n. is described from a small spring entering Lake Kuril'skoe, southern Kamčatka Peninsula. It is characterised by small body dimensions, the presence of septal glands at 3/4–5/6, by short spermathecae uniting before the connection with the oesophagus and equipped with simple, sperm-filled diverticula, and by simple sperm ducts and penial bulbs.

Key Words: Oligochaeta, Enchytraeidae, new species, stream, Russian Far East.

Introduction

The enchytraeid fauna of non-marine habitats of the Russian Far East is poorly known, although experience in Europe and North America has shown that enchytraeids are important members of the communities of wet habitats in cold climates. Only 13 species of enchytraeid have been recorded from non-marine habitats in far north-eastern Russia (Kamčatka Peninsula and regions to its north), and ten of these are members of the genus *Mesenchytraeus* Eisen, 1878, all but one of which are probably endemic (Timm 1999). Members of the genus are largely confined to cold temperate and Arctic regions, and a large proportion of the known species are described from the western Nearctic and eastern Palaearctic. It seems probable, therefore, that there are many more species of the genus awaiting discovery in eastern Russia. Only two species of enchytraeid are recorded from terrestrial and freshwater habitats on the Kamčatka Peninsula: *Mesenchytraeus* cf. *armatus* (Levinsen, 1884) and *Lumbricillus kamtschatkanus* (Michaelsen, 1929) (Sokol'skaja 1972, 1983), and two more on the nearby Bering Island: *M. grebnitzkyi* Michaelsen, 1901 and *M. beringensis* Eisen, 1904 (Michaelsen 1901, Eisen 1904).

This paper describes a new species of *Mesenchytraeus* from aquatic habitats in the south of Kamčatka.

Material and Methods

Several hundred specimens were collected in June–July, 1994, during research on spawning grounds of the Pacific salmon in Lake Kuril'skoe by the Kamčatkan

Branch of the Pacific Research Institute of Fisheries and Oceanography (TINRO), Petropavlovsk-na-Kamčatke. Kuril'skoe is a large (77 km²) crater lake in southern Kamčatka, at 51°27'N, 157°03'E. Three sites were sampled repeatedly: the lake littoral near the stream outflow, the beginning of the outflowing Ozernaja River, and a small stream named Zolotoj Kljuc (meaning Golden Spring in Russian) flowing into the lake near the river outflow. The new species occurred at all three sites, but most abundantly, and dominating the oligochaete community, in the stream.

Samples were taken with a Russian version of the Surber sampler, called the Levanidov benthometer (Levanidov 1976), with an area of 30×40 cm. Specimens were preserved in 70% alcohol or 4% formaldehyde and whole mounted in Canada balsam, either stained with Borax Carmine or unstained. Some observations were made on temporary mounts in Amman's lactophenol. Sections of three specimens were stained according to Hauser (1969). All measurements refer to fixed specimens compressed under a cover slip.

Type material is deposited in the Swedish Museum of Natural History, Stockholm (SMNH); Zoological Institute, St. Petersburg (ZIN); Zoological Institute and Zoological Museum, University of Hamburg (ZMUH); and Vörtsjärv Limnological Station, Rannu, Estonia (VLS); other material is in the authors' collections.

***Mesenchytraeus kuril* sp. n.**

Material. Holotype. SMNH 5189, collected from Zolotoj Kljuc by the Kamčatkan Branch of the Pacific Research Institute of Fisheries and Oceanography (TINRO), sample 041.31, 30.6.1994. Paratypes. Whole mounts, all from Zolotoj Kljuc, 041.31: SMNH 5190–5194, ZIN 48173–48174, VLS 27.1. Transverse sections, Ozernaja River, 036.57, 20.7.1994, VLS 27.2. Other material examined. 29 permanent mounts in the collection of BH and about 30 temporary whole mounts.

Type locality. Zolotoj Kljuc, a small stream sampled 20 m before it enters Lake Kuril'skoe. At the sampling point, the stream was 50–80 cm wide between 1–1.5 m high banks overgrown by tall herbs. The water was 5–15 cm deep, the current velocity was 0.6–0.8 m s⁻¹, and the substratum was pebbles and gravel over coarse sand. Ice cover persisted until mid-June and water temperature rose from 1–5°C in June to 7–9°C in early August, 1994.

Etymology. 'Kuril' is one of the vernacular names for the ancient Ainu people who formerly lived in the region, and after whom the lake is named. Noun in apposition.

Description. Slender, rather fragile worms, length 4.5–6.0 mm, width 0.20–0.28 mm in preclitellar region, often greatest in segments III–V, 0.24–0.32 at clitellum, narrowing to 0.14–0.16 mm in terminal segments. Segments 32–40 (mean 36.4, n=11). Prostomium about as long as wide, rounded or conical, covered with small glands (Fig. 1A), head pore at or just below tip. Segment I half as long, or less, than II. No conspicuous epidermal glands. Clitellum over XII–XIII, glands only well developed on a few specimens, in these worms body wall up to 21 µm thick dorsally, with small, irregularly arranged gland cells, absent between male pores. Chaetae thin, sigmoid, sharply pointed, with slight nodulus (Fig. 1B), 4–7, rarely 8–9, per bundle in the preclitellar region, absent in XII, 2–5 per bundle behind clitellum, bundles fan-like; chaetae 42–64 µm long, those towards midline somewhat shorter.

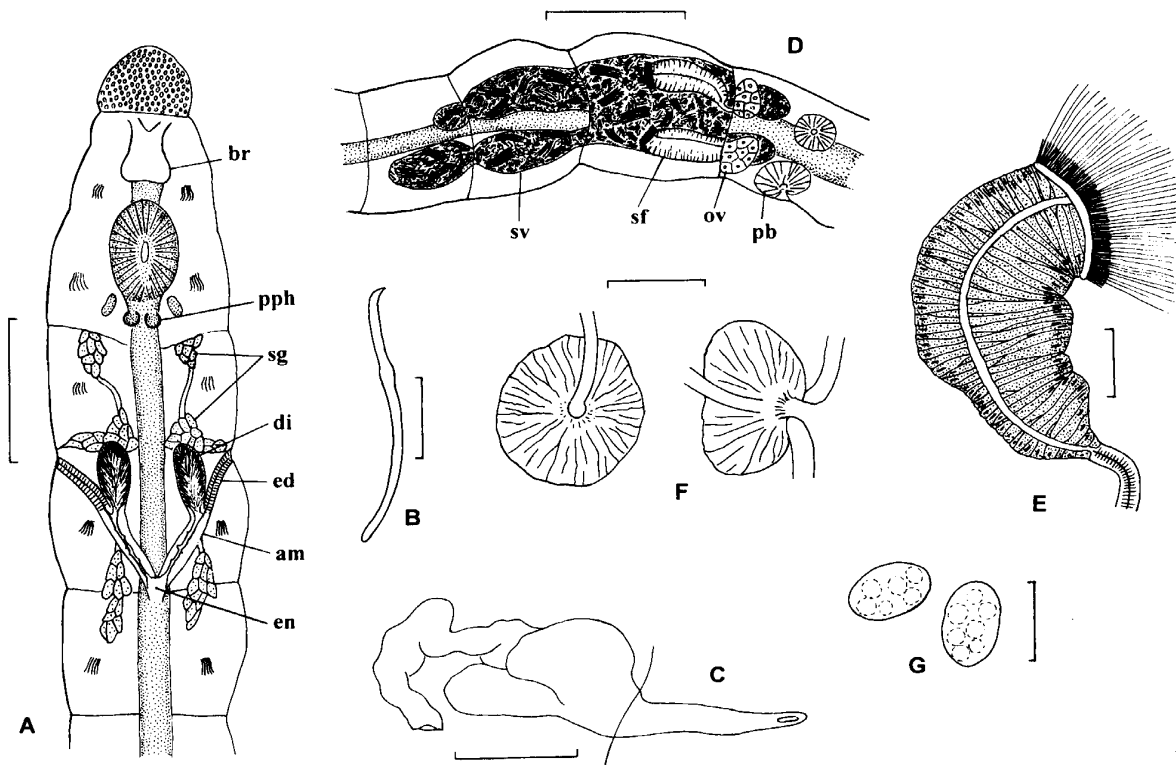


Fig. 1. *Mesenchytraeus kuril* sp. n. A, dorsal view of the anterior segments; B, chaeta; C, nephridium; D, ventral view of the genital segments; E, sperm funnel; F, penial bulb, dorsal (left) and lateral (right) views; G, coelomocytes. Abbreviations: am, ampulla of spermatheca; br, brain; di, diverticulum of spermatheca; ed, ectal duct; en, chamber formed by fusion of ental ducts of spermathecae; ov, ovary; pb, penial bulb; pph, post-pharyngeal gland; sf, sperm funnel; sg, septal gland; sv, seminal vesicle. Scale bars 200 μ m (A, D), 50 μ m (C, E, F), 20 μ m (B, G).

Gut without diverticula. Foregut (oesophagus) usually bent upwards in V, widening slightly in VI; gut about twice as wide behind clitellum as before. Chloragocytes small, about same size as coelomocytes. Two small spherical glands attached to oesophagus just behind pharynx (post-pharyngeal bulbs of Stephenson (1930)), and two small masses of glandular tissue lateral to them (Fig. 1A). Three pairs of small septal glands on septa 3/4, 4/5, and 5/6, consisting of simple separate cell masses situated dorsally, with or without small ventral lobes (Fig. 1A). Secondary septal glands absent. Anterior border of brain indented or cleft, posterior border indented or sinuate, length 100–110 μ m, slightly longer than wide or up to a quarter longer (Fig. 1A). Dorsal vessel originating in XII, blood colourless. Coelomocytes oval, 16–22 μ m long, with large nucleus and some non-staining inclusions, possibly vacuoles (Fig. 1G); cells mostly distorted and aggregated in dense clumps in preserved material. Nephridia of *Mesenchytraeus* type. Usually only one preclitellar pair at 7/8–8/9 or 9/10, postclitellar nephridia usually from about XIV to XVIII–XX, four or five pairs, absent in posterior part of body. Preseptale consisting of small nephrostome on long neck; postseptale with two large lobes and long, wide efferent duct, usually twisted or folded (Fig. 1C); nephridiopore anterior to

chaetae. In a few whole mounts, especially those mounted in lactophenol, and also in sections, nephridium seen to consist of loose bundles of tubuli 10–19 μm wide.

Testes indistinguishable from their products. Paired seminal vesicles extending forward into X or IX, typically asymmetrically, and backward into XII or bulging inside egg sacs as far as 13/14 (Fig. 1D). Sperm development synchronous and vesicle contents either predominantly morulae or spermatozoa. Sperm funnels about two-thirds, or nearly equal to, diameter of XI, 200–320 μm long, 80–140 μm wide behind collar, tapering to 60 μm wide in distal third; lumen eccentric, collar narrow, equal to or slightly wider than glandular funnel (Fig. 1E). In some specimens, large numbers of spermatozoa, with heads measuring 10 μm , attached to collar; in others with fully developed seminal vesicles, collars apparently devoid of sperm. Vasa deferentia 7–14 μm in diameter with narrow lumen, mostly forming tight ventral coils in anterior of XII, without atrial enlargement, entering penial bulbs centrally. Bulbs ventral, 50–120 μm in diameter, separated by width of nerve cord, consisting of masses of tall, glandular cells and muscle strands (Fig. 1F). Accessory glands associated with bulb absent. Egg sac paired, extending as far as XIV, containing a few small eggs and groups of ovarian cells. Spermathecae in V with lateral pores in intersegmental groove 4/5 (Fig. 1A). Ectal ducts stout, thick-walled, 50–80 μm long, 20–24 μm wide, with lumen about 4 μm wide, leading to narrow ampullae 90–100 μm long. Each ampulla with narrow lumen and sole-shaped diverticulum; latter 70–160 \times 30–50 μm , arising from near junction with ectal duct and directed ventrally. Diverticula packed with sperm with their heads buried in the wall. Ampullae tapering entally, their walls becoming thinner, finally uniting to form a small chamber just before joining with oesophagus dorsally (seldom ventrally) in posterior part of V or anterior of VI. Ampullae and ental ducts not clearly differentiated; small amounts of sperm sometimes present in both of them.

Discussion

The present specimens do not recall a typical *Mesenchytraeus* in outward appearance, their small size and slender form being more characteristic of *Cernosvitoviella* Nielsen and Christensen, 1959, the only other enchytraeid genus possessing nodulated, sigmoid chaetae. Internally, however, the worms present the main features of a *Mesenchytraeus*, especially the characteristic nephridia with poorly developed tissue surrounding the tubuli, a preseptale consisting of a small, free nephrostome on a narrow neck, and a lobed postseptale with the efferent duct arising anteriorly. In live specimens of the genus, the *Mesenchytraeus*-type of nephridium is unmistakable, but in permanent mounts, its unique features are not always obvious. It was necessary to examine a large number of specimens of *M. kuril*, including about 30 temporary mounts, before the organ could be fully described. The tubuli, in particular, were inconspicuous, the whole organ being more or less opaque, possibly as a result of fixation. The other important character distinguishing *Mesenchytraeus* from *Cernosvitoviella* is the presence of a muscular penial bulb.

Mesenchytraeus is a heterogeneous genus in need of revision. Eisen's (1878) diagnosis has undergone a number of amendments to take account of characters in species described subsequently (Michaelsen 1900; Eisen 1904; Čejka 1914; Welch

1920; Černosvitov 1937; Nielsen and Christensen 1959; Healy 1996), but although the genus is well defined, there are exceptions to many of the characters listed by these authors. Several features of *M. kuril* are rare in the genus, in particular details of the spermatheca and male organs. Among about 80 known species of *Mesenchytraeus*, spermathecae communicating with the oesophagus, bearing single diverticula, are found only in *M. armatus* (Levinsen, 1884), *M. flavus* (Levinsen, 1884), *M. ogloblini* Černosvitov, 1928, and *M. celticus* Southern, 1909 (see Levinsen 1884; Southern 1909; Černosvitov 1928). *Mesenchytraeus kuril* differs from these species in the absence of secondary septal glands, and in the male ducts lacking atrium or glands associated with the penial bulb. The absence of any modification of the typical enchytraeid penial bulb or the distal section of the vas deferens is itself uncommon in *Mesenchytraeus* species. The presence of ovarian tissue in the postclitellar part of the egg sac is explained by the fact that the most advanced eggs are at the centre of the ovary (Eisen 1879). Fusion of the spermathecae before union with the oesophagus has not previously been recorded in *Mesenchytraeus*.

The presence of septal glands at 3/4, with the same form and structure as those at 4/5 and 5/6, deserves special mention. They are also present in a new species of *Mesenchytraeus* from western North America (Healy and Fend in press) but have not been observed in any other enchytraeids. The septa with which they are associated are clearly visible, although they may be reduced to dorsal and ventral strands, and ducts connecting the glands with those at 4/5 and with the pharynx can be traced in some of the mounts. Although Stephenson (1930) describes septa as starting at 3/4 or 4/5, septa anterior to 4/5 have not subsequently been reported. However, nephridia, normally associated with septa, occur in two species of *Cognettia* (Bauer 1993; Christensen and Dózs-Farkas 1999).

Acknowledgements

The authors are greatly indebted to Drs T. S. Všívkova (Institute of Biology and Pedology, Far East Branch of the Russian Academy of Sciences, Vladivostok) and T. L. Vvedenskaja (Kamčatkan Branch of the Pacific Research Institute of Fisheries and Oceanography, Petropavlovsk-na-Kamčatke) for sampling and delivering the material.

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